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ISCHEMIC HEART DISEASE DETECTION Attorney's Docket No. P8158 Inventor: Ferek-Petric, Bozidar

What is claimed is:

- 1. An implantable medical device system comprising:
 - a sensor to output a blood flow rate signal representing a rate of blood flow through a coronary sinus of a patient's heart;
 - an implantable medical device (IMD) coupled to the sensor; and a circuit embedded within the IMD configured to analyze the blood flow rate signal and detect a cardiac condition as a function of the blood flow rate signal.
- 10 2. The system of claim 1, wherein the cardiac condition includes ischemic heart disease.
 - 3. The system of claim 1, wherein the cardiac condition includes a myocardial infarction.
 - 4. The system of claim 1, wherein the cardiac condition includes a thrombus occluding a coronary artery.
- 5. The system of claim 1, wherein the microcomputer circuit is configured to determine a rate of change for the blood flow rate signal
 - 6. The system of claim 1 further comprising an implantable lead to output a signal representing electrical activity sensed from the patient's heart, wherein the microcomputer circuit is configured to analyze the electrical activity signal and to detect the cardiac condition as a function of the blood flow rate signal and the electrical activity signal.
 - 7. The system of claim 6, wherein the microcomputer circuit is configured to determine a rate of change for electrical activity signal.
 - 8. The system of claim 6, wherein the microcomputer circuit monitors an ST segment of the electrical activity signal.

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- 9. The system of claim 1 further comprising a drug deliver system to provide a therapeutic drug when the IMD detects the cardiac condition.
- 10. The system of claim 9, wherein the therapeutic drug is a thrombolytic.
- 11. The system of claim 1, wherein the sensor is integrated in a coronary sinus lead for implantation in the coronary sinus of a patient's heart.
- 12. The system of claim 1, wherein the IMD includes an alarm activated by the microcomputer circuit when the cardiac condition is detected.
 - 13. The system of claim 12, wherein the alarm comprises an audible alarm.
 - 14. The system of claim 12, wherein the alarm comprises a muscle-stimulating device.
 - 15. The system of claim further comprising a pacing lead coupled to the IMD, and further wherein the IMD comprises pacing control circuit to deliver pacing pulses as a function of the sensed blood flow rate signal and the sensed electrical activity.
 - 16. The system of claim 1, wherein the microcomputer circuit is configured to log the sensed blood flow rate signal over a period of time, and further wherein the microcomputer circuit detects the cardiac condition by analyzing a trend of the blood flow rate signal.
 - 17. The system of claim 1 and further including a defibrillation electrode to carry defibrillation pulses from the IMD to the patient's heart.
 - 18. The system of claim 1, wherein the microcomputer circuit is configured to calculate the integral of the blood flow signal.
 - 19. A method for pacing a patient's heart using an implanted medical device comprising:

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sensing a rate of blood flow through a coronary sinus of a patient's heart;

detecting a cardiac condition as a function of the sensed blood flow.

- 5 20. The method of claim 19, wherein detecting the cardiac condition includes detecting ischemic heart disease.
 - 21. The method of claim 19, wherein detecting the cardiac condition includes detecting a myocardial infarction.
 - 22. The method of claim 19, wherein detecting the cardiac condition includes detecting a thrombus occluding a coronary artery.
 - 23. The method of claim 19 further including calculating a rate of change for the blood flow.
 - 24. The method of claim 19 further comprising:

 sensing electrical activity from a patients heart; and

 detecting the cardiac condition as a function of the sensed blood

 flow through the coronary sings and the sensed electrical activity.
 - 25. The method of claim 24 further including calculating a rate of change for the sensed electrical activity.
 - 25 26. The method of claim 24 further including analyzing an elevation for an ST segment of the sensed electrical activity.
 - 27. The method of claim 19 further comprising delivering a therapeutic drug when the cardiac condition is detected.
 - 28. The method of claim 19, wherein the therapeutic drug is a thrombolytic.
 - 29. The method of claim 19 further including activating an alarm when the cardiac condition is detected.

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- The method of claim 29, wherein activating an alarm includes activating an audible alarm.
- 5 31. The method of claim 29, wherein activating an alarm includes activating a musclestimulating alarm.
 - 32. The method of claim 19 further including deliver pacing pulses as a function of the sensed blood flow rate signal and the sensed electrical activity
 - 33. The method of claim 19 further including:
 logging the sensed blood flow rate signal over a period of time; and
 analyzing the log to detect the cardiac condition.
 - 34. The method of claim 19 further including calculating the integral of the sensed blood flow.
 - 35. An implantable multi-chamber pacing system comprising:

atrial sense means for sensing atrial signals from an atrium of a patient's heart;

ventricular sense means for sensing ventricular signals from a patient's right ventricle;

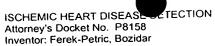
coronary sense means for sensing ventricular signals from the patent's left ventricle and for sensing a signal representing a blood flow rate through the patient's coronary sinus, and

signal processing means for analyzing the ventricular signals, the atrial signals and the blood flow rate to detect a cardiac condition.

36. The pacing system of claim 35, wherein the signal processing means includes analyzing means for integrating the blood flow rate signal from the coronary sense means.

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- 37. The pacing system of claim 35 and further including dispensing means for dispensing a therapeutic drug when the cardiac condition is detected.
- 38. The pacing system as described in claim 35, comprising programmer means for enabling the signal processing means.
- 39. The pacing system as described in claim 35, comprising defibrillation means for generating and providing a defibrillation pulse to the patient's heart.
- 40. An implantable medical device comprising:

an input adapted to receive a blood flow signal representing a velocity of blood flowing through a coronary sinus of a patient's heart;

an input adapted to receive a sensed signal representing electrical activity within the patient's heart;

alarm circuitry; and

a microcomputer circuit configured to activate the alarm circuitry as a function of the blood flow signal and the sensed electrical activity signal.

- 20 41. The device of claim 40, wherein microcomputer circuit is configured to compute the integral of the signal.
- 42. The device of claim 41 further including a digital controller/timer circuit configurable by the microcomputer circuit to output pacing stimuli as a function of the blood flow signal and the sensed electrical activity signal.